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A BUYER'S GUIDE FOR MICROFILM READER EVALUATION

In choosing a microfilm reader, many factors must be evaluated. Any one of a dozen characteristics, some not too obvious, may seriously affect the immediate or long-term utility of the reader. It is a fact that in many past installations, the choice of readers deficient in some respect has adversely affected the acceptance and use of an entire microfilm system, and reduced or nullified the anticipated cost and time savings.

A microfilm reader is basically a film projector using a rear-projection screen. Due to size limitations, the optical path may become extremely complex. In addition to optical considerations, the many types of microfilm material to be read add mechanical problems. Lastly, freedom from excessive maintenance is a design criterion.

Because the reader characteristics are considered the most vital to the user, the printing output requirements are of less importance and in many instances a matter of accepting the built-in reproduction features of the reader/printer. Therefore, a comprehensive check list for this feature has been omitted. However, where the reader characteristics between two readers are considered equal, it is suggested that the type of printing paper and the developing process be compared. Some of the major points to be evaluated are: The shelf life of the paper if filing is required; the loss of the image when exposed to normal office lighting; the contrast between the image and background; and the speed of the reproduction cycle; and when reproducing classified material select a paper stock that is destructable.

The following is a check-list of the important desirable characteristics of a good microfilm reader, selected through a series of industrial interviews.

First given is the list of factors to be considered. These are not necessarily listed in order of importance, since a poor performance in any item negates good design in other respects. Following the list, each item is treated in greater depth.

EVALUATION CHECK LIST

1. Image Brightness
2. Image Sharpness
3. Viewing Angle
4. Carrier Versatility
5. Ease of Scanning
6. Screen Size
7. Space Occupied
8. Operating Temperature
9. Film Protection
10. Operating Noise
11. Useful Lamp Life
12. Prevention of Internal Dust

1. IMAGE BRIGHTNESS

Optimum screen image brightness is not only proportionate to the ambient light in the room, but also affected by the user's position relative to windows or artificial light sources. In general, a brighter image is required in a well-lighted room, and still brighter when the reader is positioned with either front or back to a window or other very bright light source. This last is not always considered; the fact that a viewer's eyes have adapted to the daylight he is facing demands a higher screen brightness even though no daylight is falling on the screen itself.

In relatively low room-light levels, an extremely high screen brightness will lead to eyestrain. This is the reason that experts in eye health recommend that one should not watch a bright television screen in a completely darkened room.

Finally, subject matter furnishes another variable. Screen brightness, for maximum readability with minimum eyestrain, may be much higher when viewing negative formats than when the subject matter consists of microfilm positives.

2. IMAGE SHARPNESS

Comfortable, long-period viewing is very dependent on a sharp, high-resolution image over the entire screen surface. Such sharpness is dependent on the total optical system. The quality and positioning of every lens and mirror is critical since all are in the light path which finally results in an image on the screen. In the projection lens itself, the following are some of the requirements;

A. Large aperture, Anti-Reflection Coated (for maximum screen brightness with minimum wattage).

B. Flat Field (for optimum sharpness in both center and corners of screen).

C. Wide Angular Coverage (for maximum screen size with minimum over-all reader dimensions, without loss of brightness and definition in corners, often referred to as "vignetting").

D. Good Depth of Focus and Depth of Field. (Especially essential when viewing aperture cards or microfilm jackets, situations in which the film may not be held in a truly flat plane. In a 24X reader, a difference of 1/64" in the film plane is equal to a movement of 9" at the screen -- the factor being the square of the magnification.)

E. Absence of "barrel" or "pincushion" distortion and astigmatism. (Straight lines should be straight, and a point should project as a sharp dot rather than as a small blurred cross. One can recognize the astigmatic effect in the common representation of a star on Christmas cards!)

In projection lenses as in camera lenses, it is difficult to satisfy the last four requirements simultaneously with the first (and prime) objective of high image brightness. Precise tooling and manufacture of lens elements and metal parts are as important as the optical design.

3. VIEWING ANGLE

It is important in all rear-projection systems to determine the widest angle from which a satisfactory image can be viewed. It should be possible for two or three persons to view an image simultaneously while discussing it, without having to change places in turn because the image would be satisfactory only when viewed head-on.

Secondly, the height of the reader screen in relationship to the viewer's eye-level should not be critical. An image should be fully readable even if the user is standing rather than sitting at his desk.

A wide viewing angle is a function of the optical and illumination system as well as of the screen itself.

4. CARRIER VERSATILITY

Microfilm is available in a large number of formats, and no truly "universal" design would be desirable because of excessive compromise However, the survey indicated the need for a design to handle various unitized formats efficiently: microfiche, micro jackets, aperture cards, etc. The following were features most often requested:

The film carrier should permit the insertion of microfiche, jackets or aperture cards either vertically or horizontally.

Because in actual use two aperture cards are often being compared, the carrier should hold <u>two</u> cards. (A moment's thought or observation of an engineer using ordinary white-prints will bear this out.)

5. EASE OF SCANNING

Film insertion and image selection must be convenient to either hand interchangeably.

This is necessary for efficient note-taking or for "taking-off" details from information on the screen, by either right or left-handed operators.

The controls should be positioned low on the front of the reader so that the image may be moved or focused with the operator's arm resting comfortably on the desk.

A method of indexing should be provided so that individual frames can be located. A simple changeover should be provided so that not only COSATI spec. 'fiche may be indexed, but also other popular commercial formats.

6. SCREEN SIZE

A "must" requirement is that the screen must be at least 11" high for full-size projection of $8\frac{1}{2}$" x 11" originals.

7. SPACE OCCUPIED

A Reader should occupy as little desk space as possible, in proportion to the size of the viewing screen.

8. OPERATING TEMPERATURE

For the user's comfort, a reader should run cool, and in spite of high lamp wattages, should not radiate heat toward the operator. Tests in this regard should be made after the reader has been turned on for several hours.

9. FILM PROTECTION

A most important characteristic of readers which must be carefully evaluated is protection of valuable and sometimes irreplaceable originals while in use.

Protection of film from scratches and gouges is best accomplished by keeping the film between glass plates during the entire period it is in the reader. It is not usually sufficient to use pressure plates only during projection; most scratching occurs while the micro format is being moved from frame to frame.

Even more important is prevention of damage to the film because of overheating in the film gate, a more serious problem with silver film than with diazo. A test should be made showing the effect on the film when left in the same position in the reader for an hour or more.

10. OPERATING NOISE

Ventilating blowers on desk-top devices can be very noisy and annoying, and the problem is magnified when there are several such devices in a relatively quiet office. Readers for office use should be carefully evaluated in this regard.

11. USEFUL LAMP LIFE

A prime subject for careful evaluation is useful lamp life. Many readers make use of a 12v. automotive lamp operated at 14v. to increase screen illumination. Not only does this cause rapid burn-out (25-50 hours) but the lamp interior gradually discolors ar light emission drops for some time before burn-out. The high temperature of lamps operating at higher than rated voltage also leads to excessive deterioration and frequent replacement of sockets.

It is characteristic of quartz-iodine lamps that they are "self-cleaning" and do not lose brilliance with aging.

12. PREVENTION OF INTERNAL DUST

The lenses and mirrors comprising an efficient optical system must remain free from dust to maintain the reader's original sharpness and brilliance.